

Home

Online Library ACP

- Recent Final Revised Papers
- Volumes and Issues**
- Special Issues
- Library Search
- Title and Author Search

Online Library ACPD

Alerts & RSS Feeds

General Information

Submission

Review

Production

Subscription

Comment on a Paper



▣ Volumes and Issues ▣ Contents of Issue 5

Atmos. Chem. Phys., 9, 1621–1637, 2009

www.atmos-chem-phys.net/9/1621/2009/

© Author(s) 2009. This work is distributed

under the Creative Commons Attribution 3.0 License.

## The Tropical Tropopause Layer 1960–2100

A. Gettelman<sup>1</sup>, T. Birner<sup>2</sup>, V. Eyring<sup>3</sup>, H. Akiyoshi<sup>4</sup>, S. Bekki<sup>6</sup>, C. Brühl<sup>8</sup>, M. Dameris<sup>3</sup>, D. E. Kinnison<sup>1</sup>, F. Lefevre<sup>6</sup>, F. Lott<sup>7</sup>, E. Mancini<sup>11</sup>, G. Pitari<sup>11</sup>, D. A. Plummer<sup>5</sup>, E. Rozanov<sup>10</sup>, K. Shibata<sup>9</sup>, A. Stenke<sup>3</sup>, H. Struthers<sup>12</sup>, and W. Tian<sup>13</sup>

<sup>1</sup>National Center for Atmospheric Research, Boulder, CO, USA

<sup>2</sup>University of Toronto, Toronto, ON, Canada

<sup>3</sup>Deutsches Zentrum für Luft- und Raumfahrt, Oberpfaffenhofen, Germany

<sup>4</sup>National Institute for Environmental Studies, Tsukuba, Japan

<sup>5</sup>Canadian Centre for Climate Modeling and Analysis, Victoria, BC, Canada

<sup>6</sup>Université Pierre and Marie Curie, Service d'Aeronomie, Paris, France

<sup>7</sup>L'Institut Pierre-Simon Laplace, Ecole Normale Supérieure, Paris, France

<sup>8</sup>Max Planck Institut für Chemie, Mainz, Germany

<sup>9</sup>Meteorological Research Institute, Tsukuba, Japan

<sup>10</sup>Physikalisch-Meteorologisches Observatorium Davos, Davos, Switzerland

<sup>11</sup>Università degli Studi de L'Aquila, L'Aquila, Italy

<sup>12</sup>National Institute for Water and Atmosphere, New Zealand

<sup>13</sup>University of Leeds, Leeds, UK

**Abstract.** The representation of the Tropical Tropopause Layer (TTL) in 13 different Chemistry Climate Models (CCMs) designed to represent the stratosphere is analyzed. Simulations for 1960–2005 and 1980–2100 are analyzed. Simulations for 1960–2005 are compared to reanalysis model output. CCMs are able to reproduce the basic structure of the TTL. There is a large (10 K) spread in annual mean tropical cold point tropopause temperatures. CCMs are able to reproduce historical trends in tropopause pressure obtained from reanalysis products. Simulated historical trends in cold point tropopause temperatures are not consistent across models or reanalyses. The pressure of both the tropical tropopause and the level of main convective outflow appear to have decreased (increased altitude) in historical runs as well as in reanalyses. Decreasing pressure trends in the tropical tropopause and level of main convective outflow are also seen in the future. Models consistently predict decreasing tropopause and convective outflow pressure, by several hPa/decade. Tropical cold point temperatures are projected to increase by 0.09 K/decade. Tropopause anomalies are highly correlated with tropical surface temperature anomalies and with tropopause level ozone anomalies, less so with stratospheric temperature anomalies. Simulated stratospheric water vapor at 90 hPa increases by up to 0.5–1 ppmv by 2100. The result is consistent with the simulated increase in temperature, highlighting the correlation of tropopause temperatures with stratospheric water vapor.

▣ [Final Revised Paper](#) (PDF, 1733 KB) ▣ [Discussion Paper](#) (ACPD)

Citation: Gettelman, A., Birner, T., Eyring, V., Akiyoshi, H., Bekki, S., Brühl, C., Dameris, M., Kinnison, D. E., Lefevre, F., Lott, F., Mancini, E., Pitari, G., Plummer, D. A., Rozanov, E., Shibata, K., Stenke, A., Struthers, H., and Tian, W.: The Tropical Tropopause Layer 1960–2100, Atmos. Chem.

Search ACP

Library Search

Author Search

News

- ▣ Sister Journals AMT & GMD
- ▣ Financial Support for Authors
- ▣ Journal Impact Factor
- ▣ Public Relations & Background Information

Recent Papers

01 | ACPD, 12 Mar 2009:  
A new insight on tropospheric methane in the Tropics – first year from IASI hyperspectral infrared observations

02 | ACP, 12 Mar 2009:  
HOCl chemistry in the Antarctic Stratospheric Vortex 2002, as observed with the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS)

03 | ACP, 12 Mar 2009:  
Comparison of tropospheric gas-phase chemistry schemes for use within global models

